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**DETAILED DESCRIPTION**

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[Detailed Description of the Invention]

[0001]

[Field of the Invention]About an electrophotographic photoreceptor, in more detail, by using electronic suction nature group substitution chlorogallium phthalocyanine for a photosensitive layer or the under-coating layer on a conductive base, this invention is a negative band electrotyping and relates to the electrophotographic photoreceptor of high sensitivity, high electrostatic property, and low rest potential.

[0002]

[Description of the Prior Art]As photosensitive materials in an electrophotographic photoreceptor, conventionally, Various things are proposed and various organic compounds are proposed as a charge generating material also about the electrophotographic photoreceptor of the lamination type which divided the photosensitive layer into the charge generating layer and the charge transport layer, and the electrophotographic photoreceptor of the monolayer type which has electric charge developmental potency and charge transport ability in a monolayer. The sensitivity wavelength region of the organic photoconducting material by which the conventional proposal was made is lengthened even on near-infrared semiconductor laser wavelength (780-830 nm) in recent years, The demand of using as a photo conductor for digital recordings, such as a laser beam printer, is increasing, From this viewpoint to a square RIRIUMU compound (JP,49-105536,A and a 58-21416 gazette). A triphenylamine system trisazo compound (JP,S61-151659,A), a phthalocyanine compound

(JP,48-34189,A and said 57 -148745 gazette), etc. are proposed as a photoconducting material for semiconductor lasers.

[0003]As photosensitive materials for semiconductor lasers, when using an organic photoconducting material, it is required first that that sensitization wavelength is extended to long wavelength next the electrical property of the photo conductor formed, and endurance should be good etc.

[0004]In the organic photoconductivity substance, the phthalocyanine compound attracts attention as what also shows sensitivity to a semiconductor laser wavelength area. However, the actual condition is that the phthalocyanine compound which was [ in / the semiconductor laser oscillation region ] excellent in electrophotographic properties in the negative band electrotyping from the light range is not found out. The phthalocyanine compound known conventionally has the fault that the rise of rest potential is remarkable, when using as an electrophotographic photoreceptor and it uses especially as a monolayer type photo conductor.

[0005]Various trials have been made conventionally that high electrostatic property, high sensitivity and low rest potential nature, the maintenance nature of these various characteristics in repeated use, and the maintenance nature of image quality should be given to especially the above-mentioned lamination type electrophotographic photoreceptor. In the photo conductor in which a photosensitive layer generally consists of paints and binding resin, the fall of electrostatic property, increase of a dark decay, the rise of rest potential, and image quality defects produce the difference of a grade by repetition of the electrification shot process of a certain thing. In order to prevent these defects, providing various under-coating layers containing an organic substance and mineral matter between a conductive base and a photosensitive layer has been proposed. Providing an under-coating layer between conductive bases also in the photo conductor of the monolayer composition which combines electric charge developmental potency and charge transfer ability on a conductive base is examined similarly.

[0006]The purpose of an under-coating layer is in preventing unnecessary electric charge pouring from a conductive base, maintaining moderately acceptance of the electric charge generated in

the charge generating layer at the time of exposure, and the adhesive improvement to the base of a photosensitive layer. As an example proposed until now, to JP,S47-6341,A, for example a cellulose-nitrate system resin under-coating layer, A vinyl acetate system resin under-coating layer is indicated by JP,48-26141,A, and the polyvinyl alcohol system under-coating layer is indicated for the polyamide system resin under-coating layer by JP,S48-47344,A and the 61-110153 gazette at JP,S58-105155,A, respectively. However, in order to pull out enough the effect of improvement over electrostatic property or image quality maintenance nature, when these under-coating layers were used, and the thickness of the under-coating layer was increased, there was a fault which is easy to cause the sensitivity lowering of a photo conductor and increase of rest potential. The example which, on the other hand, gives the charge transfer ability in a layer by making an under-coating layer contain an electronic receptiveness substance, and improves the function as an under-coating layer JP,S61-35551,B, Although indicated by JP,S59-160147,A, since electronic receptiveness substances currently indicated by these, such as a fluorenone compound and tetracyano quinodimethane, are fusibility at a solvent, Since an electronic receptiveness substance was eluted to a photosensitive layer when forming a photosensitive layer on an under-coating layer, there was a fault of the solvent of photosensitive layer coating liquid being limited. The under-coating layer containing electronic transition nature paints is indicated by JP,S63-208853,A and JP,S64-3671,A to these faults. However, since these under-coating layers distribute electronic transition nature paints to resin and are formed, many functions as an under-coating layer tend to be influenced by the dispersion state of paints, and they cannot necessarily be enough satisfied in particular in respect of maintenance of the image quality at the time of repeated use. The electronic transition performance of the electronic transition nature paints currently used conventionally cannot necessarily be enough satisfied to the repeated use which can maintain long-term high electrostatic property and low rest potential nature.

[0007]

[Problem(s) to be Solved by the Invention]It is in the purpose of this invention providing the electrophotographic photoreceptor which gives the good picture which high sensitivity is maintained and high

electrostatic property and low rest potential nature do not deteriorate even if it cancels and uses the fault in an above-mentioned photosensitive layer or under-coating layer repeatedly, therefore does not produce a fall or greasing of image concentration.

[0008]

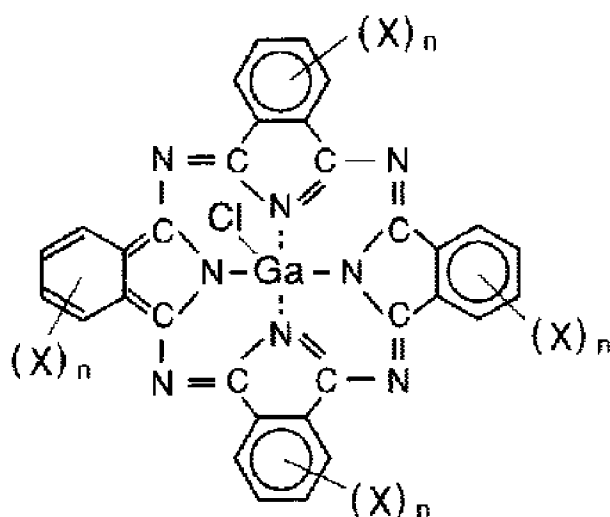
[Means for Solving the Problem] This invention persons excel [ electron transportability / of a photosensitive layer and/or an under-coating layer ] in repeated stability highly according to making a photosensitive layer and/or an under-coating layer contain specific electronic suction nature group substitution chlorogallium phthalocyanine, as a result of repeating research wholeheartedly, It finds out that an electrophotographic photoreceptor which maintains a good picture which does not produce a fall or a greasing of image concentration over a long period of time can be provided, and came to complete this invention.

[0009] That is, an electrophotographic photoreceptor of (1) this invention uses for a photosensitive layer electronic suction nature group substitution chlorogallium phthalocyanine expressed with following general formula (I).

[0010]

[Formula 2]

一般式( I )



[0011] (X express an electronic suction nature group among a formula, and n expresses the integer of 2-4.)

(2) An electrophotographic photoreceptor of this invention contains

electronic suction nature group substitution chlorogallium phthalocyanine and binding resin containing a conductive substrate, a charge generating layer, and a charge transport layer which are lamination type electrophotographic photoreceptors and by which this charge generating layer is expressed with general formula (I) given in front (1) paragraph.

[0012](3) An electrophotographic photoreceptor of this invention contains electronic suction nature group substitution chlorogallium phthalocyanine and binding resin which are a conductive substrate and a monolayer type electrophotographic photoreceptor containing a photoconductive layer and by which this photoconductive layer is expressed with general formula (I) given in front (1) paragraph.

[0013](4) An electrophotographic photoreceptor of this invention made electronic suction nature group substitution chlorogallium phthalocyanine expressed with an under-coating layer by general formula (I) given in front (1) paragraph at least contain in an electrophotographic photoreceptor which has an under-coating layer and a photosensitive layer at least on a conductive substrate.

[0014]Although positive charge moves a charge transport layer among electric charges generated near the surface in a charge generating layer in the case of a photo conductor of a lamination type and an electrifying system negates electrification charge on the surface of a photo conductor by negative electrification, If a negative charge by which it was then generated simultaneously moves a charge generating layer and a substrate is not reached, an electric charge will remain as rest potential. That is, when a charge generating layer does not have electron transport property, rest potential will rise. Especially in the case of a photo conductor of a monolayer type, electron transfer distance becomes long and this tendency becomes remarkable. It is thought that it presses down a rise of rest potential since electronic suction nature group substitution chlorophthalocyanine used for this invention has electron transport property. When  $n$  is 1, it becomes and is not [ that the above-mentioned effect that mobility is low is hard to be acquired ] desirable.

[0015]Hereafter, this invention is explained in detail. Electronic suction nature group substitution chlorogallium phthalocyanine used for this invention is expressed with said general formula (I). Here, as the

electronic suction nature group X, a halogen atom, a nitro group, a cyano group, a sulfone group, etc. are contained, especially, a halogen atom or a nitro group like a chlorine atom, a fluorine atom, and a bromine atom is preferred from a point of an effect, and a chlorine atom and a fluorine atom are still more preferred. As for n, 2-4 are used in relation to electronic transportability. When n is 1, it is not desirable from the aforementioned Reason.

[0016]Electronic suction nature group substitution chlorogallium phthalocyanine used by this invention is manufactured as follows. Namely, the phthalonitrile method for heating electronic suction nature group substituted phthalonitrile and metal chloride under heating fusion or existence of an organic solvent, The diimino iso indoline method for heating electronic suction nature group substitution diimino iso indoline and metal chloride under existence of an organic solvent, The Wyler method for heating urea and metal chloride for electronic suction nature group substitution phthalic anhydride under heating fusion or existence of an organic solvent, It can manufacture with a synthetic method of publicly known phthalocyanine compounds, such as a method to which electronic suction nature group substitution cyanobenzamide and metal salt are made to react at an elevated temperature, and a method to which electronic suction nature group substitution dilithium phthalocyanine and metal salt are made to react.

[0017]As an organic solvent used in these synthesizing methods, alpha-chloronaphthalene, beta-chloronaphthalene, alpha-methylnaphthalene, reactions, such as methoxy naphthalene, diphenylethane, ethylene glycol, dialkyl ether, quinoline, sulfolane, dichlorobenzene, dichlorotoluene, dimethylformamide, dimethylsulfoxide, and dimethylsulfoamide, -- a solvent of an inertness high boiling point is preferred. That is, electronic suction nature group substitution chlorogallium phthalocyanine used for this invention can heat, stir and compound electronic suction nature group substituted phthalonitrile and a gallium chloride compound by 140 degrees C-300 degreeC in the above-mentioned organic solvent, for example. Electronic suction nature group substitution diimino iso indoline can also be used instead of electronic suction nature group substituted phthalonitrile.

[0018]A crystal of electronic suction nature group substitution chlorogallium phthalocyanine manufactured by an above-mentioned

method may be a large diameter, and minuteness making can be carried out if needed. Minuteness making a crystal manufactured by an above-mentioned method with mechanical methods, such as a sand mill, a planet type mill, a ball mill, an oscillating-type ball mill, KOBORUMIRU, attritor, and dynomill, with grinding media. Although it carries out by carrying out wet grinding in a solvent, carrying out dry type grinding by mechanical process methods, such as an automatic mortar and planet type mill, an oscillating-type ball mill, a vertical-type cylinder vibration mill, CF mill, and a kneader, or carrying out wet grinding with grinding media further after dry type grinding, it is not limited to these methods. In the case of dry type grinding, grinding auxiliary agents, such as salt and sodium sulfate, can also be used if needed. As for processing time of dry type grinding, 2 hours or more are preferred.

[0019]A solvent used for the above-mentioned wet grinding processing, for example Methanol, ethanol, Fatty alcohol, such as n-butanol, n-propanol, and iso-propanol. Aromatic alcohol, such as benzyl alcohol, phenethyl alcohol, and alpha-phenyl ethyl alcohol. Aliphatic polyhydric alcohol, such as glycerin and a polyethylene glycol. Phenols, such as phenol, cresol, and catechol, dimethylformamide, Aliphatic series amide, such as dimethylacetamide, dimethyl sulfoxide, Ester species, such as sulfur derivatives, such as a propane sultone, ethyl acetate, and butyl acetate, KETONN, such as methyl ethyl ketone and cyclohexanone, diethylether, It can be independent from aromatic halogenated hydrocarbon, such as aliphatic series halogenated hydrocarbon, such as ether, such as wood ether and a tetrahydrofuran, and a methylene chloride, chlorobenzene, and dichlorobenzene, water, etc., or can choose from two or more sorts of partially aromatic solvents.

[0020]As for quantity of a solvent to be used, 10-100 copies are preferably used one to 200 weight section to electronic suction nature group substitution chlorogallium phthalocyanine 1 weight section. As for processing time of wet grinding, 3 hours or more are preferred, and treatment temperature is preferably processed by 10-60 degreeC 0degreeC - below the boiling point of a solvent.

[0021]The wet process of the electronic suction nature group substitution chlorogallium phthalocyanine used by this invention can be

carried out in a solvent following dry type grinding if needed. Methanol which is indicating a solvent used for a wet process, for example in a JP,5-98181,A gazette and a JP,5-194523,A gazette, Fatty alcohol, such as ethanol, n-butanol, n-propanol, and iso-propanol. Aromatic alcohol, such as benzyl alcohol, phenethyl alcohol, and alpha-phenyl ethyl alcohol. Aliphatic polyhydric alcohol, such as glycerin and a polyethylene glycol. Phenols, such as phenol, cresol, and catechol, dimethylformamide, Aliphatic series amide, such as dimethylacetamide, dimethyl sulfoxide, Ester species, such as sulfur derivatives, such as a propane sultone, ethyl acetate, and butyl acetate, Ketone, such as methyl ethyl ketone and cyclohexanone, diethylether, It can be independent from aromatic halogenated hydrocarbon, such as aliphatic series halogenated hydrocarbon, such as ether, such as wood ether and a tetrahydrofuran, and a methylene chloride, chlorobenzene, and dichlorobenzene, water, etc., or can choose from two or more sorts of partially aromatic solvents. As a processing unit, although a ball mill, attritor, a roll mill, KOBORUMIRU, a sand mill, a homomixer, etc. can be used, it is not limited to these. As for quantity of a solvent to be used, 10-100 copies are preferably used one to 200 weight section to electronic suction nature group substitution chlorogallium phthalocyanine 1 weight section. As for time of a wet process, 3 hours or more are preferred, and treatment temperature is preferably processed by 10-60 degreeC 0degreeC - below the boiling point of a solvent.

[0022]Thus, also in having processed, Cu-K alpha rays ( $\lambda=1.54\text{\AA}$ ) in an X diffraction spectrum made into X line source a bragg angle ( $2\theta \times 0.2$  degree), A crystal in which n has 2 and X has a peak at 26.8 degrees of chlorine, or 26.0 degrees - 27.5 degrees, In n, 2 and X 7.0 degrees of fluoride, 15.2 degrees and 27.1 degrees, or 6.8 degrees, 15.3 degrees, 16.4 degrees, 27.2 degrees and 28.9 degrees, or 6.8 degrees, A crystal which has a peak at 15.5 degrees, 16.5 degrees, 27.4 degrees, and 30.1 degrees, and a crystal in which n has 4 and X has a peak at 21.3 degrees of chlorine, 23.0 degrees, 24.9 degrees, 26.1 degrees, 30.7 degrees and 31.3 degrees, or 24.5 degrees - 26.5 degrees are desirable.

[0023]Two or more sorts of above-mentioned electronic suction nature substitution chlorogallium phthalocyanines are made to contain



according to the characteristic required of a photo conductor, and it can use.

[0024]Next, an electrophotographic photoreceptor which uses electronic suction nature group substitution chlorogallium phthalocyanine obtained by the above-mentioned disposal method as a photoconducting material in a photosensitive layer and/or an under-coating layer is explained. A thing of laminated constitution by which functional separation also of the thing of monolayer composition of a photosensitive layer was carried out at a charge generating layer and a charge transport layer may be sufficient as an electrophotographic photoreceptor of this invention. It may have a protective layer in the outermost layer.

[0025]An electrophotographic photoreceptor of this invention is a lamination type electrophotographic photoreceptor containing a conductive substrate, a charge generating layer, and a charge transport layer, and is characterized [ one ] by this charge generating layer containing electronic suction nature group substitution chlorogallium phthalocyanine expressed with above general formula (I), and binding resin. When a photosensitive layer has a laminated structure, a charge generating layer comprises above-mentioned electronic suction nature group substitution chlorogallium phthalocyanine and binding resin.

Drawing 1 and drawing 3 are the sectional views showing typically an electrophotographic photoreceptor which does not contain an under-coating layer in this invention. In drawing 1, a photosensitive layer which consists of the charge transport layer 12 laminated the charge generating layer 10 and on it is covered on the conductive substrate 14. In drawing 2, the undercoat layer 16 intervenes between the charge generating layer 10 and the conductive substrate 14, and the protective layer 18 is covered on the surface of a photosensitive layer in drawing 3. In drawing 4, both the undercoat layer 16 and the protective layer 18 are laminated.

[0026]An electrophotographic photoreceptor of this invention is an electrophotographic photoreceptor which has an under-coating layer and a photosensitive layer at least on a conductive base, and is characterized [ one ] by this under-coating layer containing at least electronic suction nature group substitution chlorogallium phthalocyanine expressed with above general formula (I), and binding

resin. In this case, it may be contained in an under-coating layer and both layers of a photosensitive layer although being contained only in an under-coating layer is preferred as for electronic suction nature group substitution chlorogallium taro cyanine. Drawing 5 - drawing 8 are the sectional views showing typically an electrophotographic photoreceptor which has this under-coating layer. In drawing 5, the under-coating layer 16 is arranged between a lamination type photosensitive layer and the conductive substrate 14 which consist of the charge transport layer 12 laminated the charge generating layer 10 and on it. In drawing 6, the under-coating layer 16 intervenes between the monolayer type photosensitive layer 20 which has electric charge developmental potency and charge transport ability in a monolayer, and the electric conduction base material 14. The protective layer 18 is covered by photosensitive layer surface of a photo conductor of drawing 5 in drawing 7. The protective layer 18 is covered by photosensitive layer surface of a photo conductor of drawing 6 in drawing 8. Hereafter, the above-mentioned layers 10-20 are explained in detail.

[0027]The charge generating layer 10 in an electrophotographic photoreceptor of this invention, A solution which dissolved binding resin in an organic solvent is made to distribute said electronic suction nature group substitution chlorogallium phthalocyanine, coating liquid is prepared, and it is formed in drawing 1 - 4 by applying it on the conductive substrate 14 or the undercoat layer 16. Binding resin to be used can be chosen from extensive resin. As desirable binding resin, for example Polyvinyl formal resin, polyvinyl butyral resin, Polyvinyl-acetal resin, such as partial acetalization polyvinyl butyral resin in which a part of butyral denaturalized by formal, an aceto acetal, etc., Polyarylate resin (polycondensation body of bisphenol A and phthalic acid, etc.), Polycarbonate resin, polyester resin, denaturation polyether type polyester resin, Phenoxyl resin, polyvinyl chloride resin, polyvinylidene chloride resin, polyvinyl acetate resin, Polystyrene resin, an acrylic resin, methacrylic resin, polyacrylamide resin, Polyamide resin, polyvinyl pyridine resin, cellulose type resin, polyurethane resin, An epoxy resin, silicon resin, polyvinyl alcohol resin, polyvinyl pyrrolidone resin, Casein, and a polyvinyl chloride acetate copolymer, a hydroxyl denaturation polyvinyl chloride acetate copolymer, A carboxyl

denaturation polyvinyl chloride acetate copolymer, a VCM/PVC acetic acid vinyl-maleic anhydride copolymer, a styrene butadiene copolymer, a vinylidene chloride acrylonitrile copolymer, a styrene alkyd resin, a silicon alkyd resin, Insulating resin, such as phenol-formaldehyde resin, can be raised. It can also choose from organic photoconductivity polymer, such as poly-N-vinylcarbazole, polyvinyl anthracene, and poly bottle RUPIRENTO. Especially, at least one resin chosen from a group which consists of polyvinyl-acetal resin, polyarylate resin, an acrylic resin, and methacrylic resin is still more preferred. However, it is not limited to these insulating resin or organic photoconductivity polymer. It can be independent, or two or more sorts can be mixed, and these binding resin can be used.

[0028]As carrier fluid which dissolves binding resin, methanol, ethanol, n-propanol, Alcohols, such as iso-propanol, n-butanol, and benzyl alcohol, Amide, such as ketone, such as acetone, MEK, and cyclohexanone, DMF, and dimethylacetamide. Sulfoxides, such as dimethyl sulfoxide, THF, dioxane, diethylether, Ether of annular [, such as methyl cellosolve and ethylcellosolve, ] or straight chain shape, Ester species, such as methyl acetate, ethyl acetate, and n-butyl acetate, a methylene chloride, Aliphatic series halogenated hydrocarbon, such as chloroform, a carbon tetrachloride, a dichloroethylene, and trichloroethylene. aromatic hydrocarbon, such as aromatic hydrocarbon, such as mineral oil, such as ligroin, benzene, toluene, and xylene, chlorobenzene, and dichlorobenzene, -- it can be independent, or two or more sorts can be mixed, and it can use.

[0029]a weight ratio of said electronic suction nature group substitution chlorogallium phthalocyanine and binding resin -- 40:1-1:20 -- it is the range of 10:1-1:10 preferably. Since the stability of coating liquid falls when a ratio of electronic suction nature group substitution gallium phthalocyanine is too high, and sensitivity of a photo conductor falls in passing low on the other hand, it is preferred to set it as a mentioned range. As a method of carrying out the distributed processing of the electronic suction nature group substitution chlorogallium phthalocyanine, methods, such as a publicly known method, for example, a ball mill, a SANDOGU lined mill, a planetary mill, KOBORUMIRU, and a roll mill, can be used. As a mixing method of binding resin and electronic suction nature group substitution

chlorogallium phthalocyanine, binding resin in distributed processing for example, for electronic suction nature group substitution chlorogallium phthalocyanine With powder, Or which methods, such as a method of in addition distributing simultaneously, a method of mixing dispersion liquid in a polymer solution of binding resin, or the method of mixing a polymer solution in dispersion liquid conversely, may be used as a polymer solution. Although conditions from which a crystal form of electronic suction nature group substitution chlorogallium phthalocyanine does not change are needed by distribution, it is checked that a crystal form is not changing distribution before even if it adopts any of a dispersion method enforced by this invention.

[0030]Spreading of coating liquid A dip coating method, a spray coating method, a spinner coating method, Coating methods, such as a bead coating method, a wire bar coating method, a braid coating method, the roller coating method, the air-knife-coating method, and the curtain coating method, are employable. As for desiccation of coating liquid, it is preferred after set-to-touch [ in a room temperature ] to carry out stoving under stillness or air blasting in 5 minutes - 2 hours at temperature of 30-200 degreeC. And 0.15-2.0 micrometers 0.05-5-micrometer are usually preferably suitable for thickness of the charge generating layer 10. It is difficult for thickness to obtain photosensitivity sufficient in less than 0.05 micrometer, and if 5 micrometers is exceeded, an increase in a dark decay arises and it is not desirable.

[0031]In a photo conductor which it has, the under-coating layer 16 In the case of laminated constitution (drawing 5, 7). The charge generating layer 10 Azo pigments, such as the Sudan red, DAIAN blue, and the JIESUNA green B, Quinone paints, such as the ALGOL yellow, pyrene quinone, and indanthrene brilliant violet RRP, Perylene pigments, such as kino cyanine paints and benzimidazole perylene, Indigo colors, such as indigo and a thioindigo, titanyloxyphthalocyanine, Chlorogallium phthalocyanine, hydroxygallium phtalo SHININ, Charge generating material, such as phthalocyanine pigments, such as metal free phthalocyanine, and a quinacridone pigment, polyvinyl butyral resin, Polyvinyl-acetal system resin, such as partial acetalization polyvinyl butyral resin in which a part of butyral denaturalized by formal, an aceto acetal, etc., Binding resin of polyarylate resin, polyvinyl chloride acetate copolymers (polycondensation body of bisphenol A and phthalic acid,

etc.), and a hydroxyl denaturation polyvinyl chloride acetate copolymer is distributed, and it can form by carrying out coating of these dispersion liquid to the above-mentioned under-coating layer. a compounding ratio (weight) of a charge generating material and binding resin -- 40:1-1:20 -- it is the range of 10:1-1:10 preferably.

[0032]The charge transport layer 12 in an electrophotographic photoreceptor of this invention makes a charge transporting material contain in suitable binding resin, and is formed. As a charge transporting material, for example, oxadiazole derivatives, such as 2, 5-bis-(p-diethylaminophenyl)-1, 3, and 4-oxadiazole, Pyrazoline derivatives, such as 1,3,5-triphenylpyrazoline and 1-[pyridyl (2)]-3-(p-diethylaminostyryl)-5-(p-diethylaminophenyl) pyrazoline, The third class of aromatic monoamino compounds, such as a triphenylamine and benzyaniline, The third class of aromatic diamino compounds, such as N,N'-diphenyl-N,N'-bis-(m-tolyl) benzidine, 1, such as 3-(p-diethylaminophenyl)-5,6-di-(p-methoxypheny)-1,2,4-triazine, 2, 4-triazine derivative, Hydrazone derivatives, such as 4-diethylamino benzoic aldehyde 2,2-diphenylhydrazone, alpha-stilbene derivatives, such as benzofuran derivatives, such as quinazoline derivatives, such as 2-phenyl-4-styryl quinazoline, and 6-hydroxy-2,3-di-(p-methoxypheny) benzofuran, and p-(2,2-diphenylvinyl)-N,N-diphenylaniline, Although electron release substances, such as a polymer which has a basis which consists of triphenylmethane derivatives or these compounds in a main chain or a side chain, are mentioned, it is not limited to these. These charge transporting materials are independent, or two or more sorts are mixed and it is used, and when a charge transporting material is polymer, they may form a layer by itself.

[0033]As binding resin which forms the charge transport layer 12, Polycarbonate resin, polyester resin, methacrylic resin, an acrylic resin, Polyvinyl chloride resin, polyvinylidene chloride resin, polystyrene resin, Polyvinyl acetate resin, a styrene butadiene copolymer, a vinylidene chloride acrylonitrile copolymer, A polyvinyl chloride acetate copolymer, a VCM/PVC acetic acid vinyl-maleic anhydride copolymer, The same resin as what is used for said charge generating layer 10, such as silicon resin, a silicon alkyd resin, phenol formaldehyde resin, a styrene alkyd resin, and poly-N-vinylcarbazole resin, can be used. After the charge transport layer 12 prepares coating

liquid using the same thing as an organic solvent used when forming the above-mentioned charge transporting material, binding resin, and said charge generating layer 10, it can apply coating liquid on the charge generating layer 10 by the same means as the coating method, and can be formed. As for a rate of a charge transporting material and binding resin, in that case, a charge transporting material is used from the range of five to 500 weight section to binding resin 100 weight section. About 10-30 micrometers about 5-50-micrometer are generally preferably suitable for thickness of the charge transport layer 12.

[0034]Electrophotographic photoreceptors of this invention are a conductive substrate and a monolayer type electrophotographic photoreceptor containing a photoconductive layer, and are characterized [ one ] by this photoconductive layer containing electronic suction nature group substitution chlorogallium phthalocyanine expressed with above general formula (I), and binding resin. When a photosensitive layer of this invention has layer structure, a photosensitive layer consists of a photoconductive layer by which electronic suction nature group substitution chlorogallium phthalocyanine was distributed by binding resin. A charge transporting material may also be included in this layer. What has binding resin and a charge transporting material be [ the same as that of the above ] it is used, and a photoconductive layer is formed in accordance with the same method as the above. In that case, at least one sort of resin of binding resin chosen from a group which consists of polyvinyl-acetal resin, VCM/PVC vinyl acetate copolymerization resin, phenoxy resin, denaturation ether type polyester resin, polyarylate resin, an acrylic resin, and methacrylic resin is preferred. Especially, it is still more preferred that it is at least one resin chosen from a group which consists of VCM/PVC vinyl acetate copolymerization resin, polyvinyl-acetal resin, polyarylate resin, an acrylic resin, and methacrylic resin. Various additive agents, such as an antioxidant and a sensitizer, may also be included in a photosensitive layer if needed. a weight ratio of electronic suction nature group substitution chlorogallium phthalocyanine and binding resin -- 40:1-1:20 -- it is the range of 10:1-1:10 preferably. Since the stability of coating liquid falls when a ratio of electronic suction nature group substitution chlorogallium phthalocyanine is too high, and sensitivity of a photo conductor falls in passing low on the other hand, it is preferred to set it

as a mentioned range. And as for a weight ratio of a charge transporting material and binding resin, when a charge transporting material is included, setting about to 1:10 to 10:1 is preferred [ a compounding ratio (weight) of 1:20 to about 5:1 a charge generating material, and a charge transporting material ]. 10-40 micrometers 5-50-micrometer are usually preferably suitable for thickness of a photoconductive layer. If a fall of electrostatic property is seen in less than 5 micrometers and thickness exceeds 50 micrometers, a rise of rest potential is seen and it is not desirable.

[0035]In drawing 6 which has an under-coating layer, and a photo conductor of 8, the photosensitive layer 20 of layer structure is as above-mentioned.

[0036]As the under-coating layer 16 in this invention, resin for binding is distributed and electronic suction nature group substitution chlorogallium phthalocyanine is formed. As binding resin, polyester resin, polystyrene resin, polycarbonate resin, Thermoplastics, such as polyacrylate resin, polyvinyl butyral resin, polyvinyl acetate resin, ethyl cellulose resin, polysulfone resin, and polyvinyl-carbazole resin, can be used. Various thermosetting resin which is obtained by making carry out the heating polymerization of an isocyanate group content compound like a tolylene isocyanate and hexamethylene di-isocyanate and the bisphenol A type epoxy resin if needed can also be used. As carrier fluid which dissolves binding resin, methanol, ethanol, n-propanol, Alcohols, such as iso-propanol, n-butanol, and benzyl alcohol, Amide, such as ketone, such as acetone, MEK, and cyclohexanone, DMF, and dimethylacetamide. Sulfoxides, such as dimethyl sulfoxide, THF, dioxane, diethylether, Ether of annular [, such as methyl cellosolve and ethylcellosolve, ] or straight chain shape, Ester species, such as methyl acetate, ethyl acetate, and n-butyl acetate, a methylene chloride, Aliphatic series halogenated hydrocarbon, such as chloroform, a carbon tetrachloride, a dichloroethylene, and trichloroethylene. aromatic hydrocarbon, such as aromatic hydrocarbon, such as mineral oil, such as ligroin, benzene, toluene, and xylene, chlorobenzene, and dichlorobenzene, -- it can be independent, or two or more sorts can be mixed, and it can use. Content of chlorogallium phthalocyanine is three weight sections - 100 weight sections to resin 10 weight section, and is five weight sections - 70 weight sections

preferably. As a dispersion method to resin of an electronic suction nature group substitution chloro gallium phthalocyanine compound, methods, such as a publicly known method, for example, a ball mill, a SANDOGU lined mill, a planetary mill, KOBORUMIRU, and a roll mill, can be used. Although conditions from which a crystal form of an electronic suction nature group substitution chlorogallium phthalocyanine crystal does not change are needed by distribution, it is checked that a crystal form is not changing distribution before even if it adopts any of a dispersion method enforced by this invention.

[0037]Thickness is 0.05 micrometer - 12.0 micrometers, and, as for an under-coating layer in this invention, it is preferred to set it as the range of 0.1 micrometer - 10.0 micrometers. It is difficult to hold the homogeneity of thickness as thickness is 0.05 micrometer or less, and if it is not less than 12.0 micrometers, a rise of rest potential will arise in long-term use. Since electronic suction nature group substitution chlorogallium phthalocyanine in this invention is excellent in electron transportability, even if resistivity is higher than  $10^5$  currently indicated conventionally - a  $10^{14}$  omega-cm grade, it can be used, and its  $10^6$  -  $10^{16}$  omega-cm grade is preferred.

[0038]Between the conductive substrate 14 and a photosensitive layer, under-coating layers other than this invention may be provided further. Electronic suction nature substitution chlorogallium phthalocyanine is not used. As an undercoat layer, for example An aluminum anode oxide layer, an aluminum oxide, Inorganic layers, such as aluminium hydroxide, polyvinyl alcohol, casein, A polyvinyl pyrrolidone, polyacrylic acid, cellulose, gelatin, Polyglutamic acid, starch, amino starch, polyurethane, polyimide, Publicly known binding resin, such as organic metals, such as organic layers, such as polyamide, zirconium chelate compound, a zirconium alkoxide compound, titanyl chelate compound, and a titanyl alkoxide compound, and a silane coupling agent, can be used. Thickness of an undercoat layer has the preferred range of 0.01-20 micrometers, and it is most effective to be used in the range which is 0.05-10 micrometers.

[0039]As the conductive substrate 14, if usable as an electrophotographic photoreceptor, anythings can be used. Specifically Metal, such as aluminum, nickel, chromium, and stainless steel. Paper, a plastic film, etc. which were applied or impregnated with electro-



conductivity applying agents, such as a plastic film which covered thin films, such as aluminum, titanium, nickel, chromium, stainless steel, gold, vanadium, tin oxide, indium oxide, and indium tin oxide (ITO), are mentioned. Furthermore, if needed, the surface of the conductive substrate 14 may perform various kinds of processings in the range which does not have influence in image quality, for example, may perform scattered reflection processing of oxidation treatment, a surface chemical treatment and coloring processing, or graining, etc.

[0040] This invention may cover the protective layer 18 to a photosensitive layer surface if needed further. A protective layer makes a conductive material contain in suitable binding resin, and is formed. As a conductive material, aromatic amino compounds, such as metallocene compounds, such as dimethylferrocene, and N,N'-diphenyl-N,N'-bis-(m-tolyl) benzidine, Although metallic oxides, such as antimony oxide, tin oxide, titanium oxide, indium oxide, and oxidation tin oxidation antimony, can be used, it is not limited to these. As binding resin used for this protective layer, what was illustrated, for example as said binding resin can be used. As for the above-mentioned protective layer, it is preferred to constitute so that the electrical resistance may serve as  $10^9 - 10^{14}$  ohm-cm. If resistance will rise and it will become a copy with much fogging, if electrical resistance becomes higher than  $10^{14}$  ohm-cm, and it becomes lower than  $10^9$  ohm-cm on the other hand, a Japanese quince of a picture and a fall of resolution will arise. A protective layer must be constituted so that a penetration of light irradiated by resolving light may not be barred on substrate. 1-10 micrometers 0.5-20-micrometer are preferably suitable for thickness of this protective layer.

[0041] It not only uses an electrophotographic photoreceptor of this invention for an electro photography copying machine, but by choosing various each stratum functionale, it can use it as a laser beam printer and a photo conductor for electrophotographing system platemaking systems.

[0042]

[Example] Hereafter, although working example explains this invention concretely, it is not limited to these. In working example and a comparative example, a "part" means a weight section.

[The synthetic example 1] Under the synthetic nitrogen atmosphere of 2,

3, 6, 7, 10, 11, 14, and 15-octachloro-chlorogallium phthalocyanine, After having distributed ten copies of 4,5-dichlorophthalonitriles in 20 copies of alpha-chloronaphthalenes at the room temperature, adding 2.3 copies of gallium trichloride with 45 copies of alpha-chloronaphthalenes and making it react in 200 degreeC for 6 hours, output was filtered at the time of heat and DMSO and methanol washed. Subsequently, reduced pressure drying of the moist cake was carried out, and 2, 3, 6, 7, 10, 11, 14, and 6.9 copies of 15-octachloro-chlorogallium phthalocyanine (henceforth "8 Cl-ClGaPc") were obtained. The powder X diffraction figure (henceforth an "X-ray diagram") (Rigaku Rotaflex X-ray diffractometer CN2726A1:Cu-K alpha rays are made into X line source, and they are the Tube voltage of 40 kV, and Tube current [ It measured at 30 mA. ]) of the obtained compound the following -- the same . -- being shown in drawing 9 -- the infrared absorption spectrum (henceforth "IR figure") (it measured in Hitachi 270-30 Infrared Spectrophotometer.) of this compound It is the same as that of the following. It is shown in drawing 18. From IR figure, it was checked that this compound is 8 Cl-ClGaPc.

[The synthetic example 2] Under the synthetic nitrogen atmosphere of 2,3,6,7,10,11,14,15-octafluoro chlorogallium phthalocyanine, After having distributed ten copies of 4,5-difluorophthalonitriles in 20 copies of alpha-chloronaphthalenes at the room temperature, adding 2.7 copies of gallium trichloride with 45 copies of alpha-chloronaphthalenes and making it react in 200 degreeC for 5 hours, output was filtered at the time of heat and DMSO and methanol washed. Subsequently, reduced pressure drying of the moist cake was carried out, and 8.7 copies of 2,3,6,7,10,11,14,15-octafluoro chlorogallium phthalocyanines (henceforth "8 F-ClGaPc") were obtained. The X-ray diagram of the obtained compound is shown in drawing 10, and IR figure of this compound is shown in drawing 19. From this IR figure, it was checked that this compound is 8 F-ClGaPc.

[The synthetic example 3] Under the synthetic nitrogen atmosphere of hexadeca \*\*\*\*\*-\*\*\*\*\* gallium phthalocyanine, 80 g of urea, the boric acid 6g, and 64.9 copies of tetrachlorophthalic anhydrides are distributed in 100 copies of alpha-chloronaphthalenes at a room temperature, After adding ten copies of gallium trichloride with 50 copies of alpha-chloronaphthalenes and making it react in 220 degreeC

for 5 hours, output was filtered at the time of heat and DMSO and methanol washed. Subsequently, reduced pressure drying of the moist cake was carried out, and 24.3 copies of hexadeca \*\*\*\*\*\_\*\*\*\*\* gallium phthalocyanines (henceforth "16 Cl-ClGaPc") were obtained. The X-ray diagram of the obtained compound is shown in [drawing 11](#), and IR figure of this compound is shown in [drawing 20](#). From this IR figure, it was checked that this compound is 16 Cl-ClGaPc.

[Working example 1-3] Dry grinding of three copies of electronic suction nature group substitution chlorogallium phthalocyanines obtained in the synthetic examples 1-3 was carried out with the automatic mortar for 24 hours. 0.5 copy of obtained electronic suction nature group substitution chlorogallium phthalocyanine 13.5 copies of N.N-dimethylformamide, After carrying out solvent treatment for one week with 30 copies of glass beads 2 mm in diameter, the crystal was separated, it dried and 0.4 copy of electronic suction nature group substitution chlorogallium phthalocyanine was obtained, respectively. The X-ray diagram of the obtained compound is shown in [drawing 12](#) - 14, respectively, and IR figure of these compounds is shown in [drawing 21](#) - 23, respectively. In the bragg angle ( $2\theta \times 0.2$  degree) which made Cu-K alpha rays ( $\lambda = 1.54\text{\AA}$ ) X line source from these X-ray diagrams, As for 8 Cl-ClGaPc, it turns out that, as for 16 Cl-ClGaPc, 8 F-ClGaPc has a peak at 24.5 degrees - 26.5 degrees at 26.0 degrees - 27.5 degrees in 6.8 degrees, 15.3 degrees, 16.4 degrees, 27.2 degrees, and 28.9 degrees.

[Working example 4-6] Except having used 13.5 copies of methanol instead of 13.5 copies of N.N-dimethylformamide, it processed like working example 1 and 0.4 copy of electronic suction nature group substitution chlorogallium phthalocyanine was obtained, respectively. The X-ray diagram of the obtained compound is shown in [drawing 15](#) - 17, respectively, and IR figure of these compounds is shown in [drawing 24](#) - 26, respectively. In the bragg angle ( $2\theta \times 0.2$  degree) which made Cu-K alpha rays ( $\lambda = 1.54\text{\AA}$ ) X line source from these X-ray diagrams, As for 8 Cl-ClGaPc, it turns out that, as for 16 Cl-ClGaPc, 8 F-ClGaPc has a peak at 24.5 degrees - 26.5 degrees at 26.0 degrees - 27.5 degrees in 6.8 degrees, 15.5 degrees, 16.5 degrees, 27.4 degrees, and 30.1 degrees.

[Working example 7] The solution which consists of ten copies of

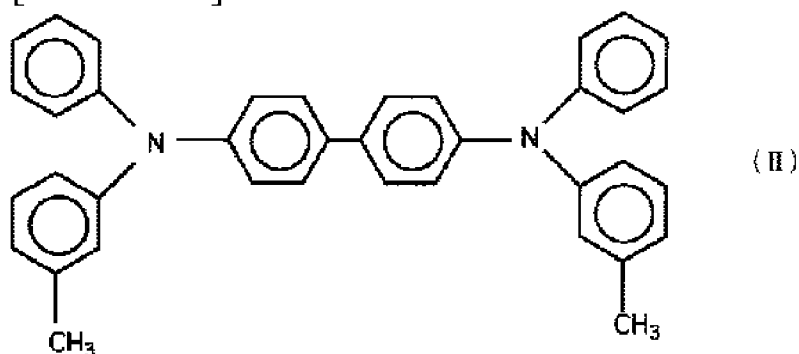
zirconium compounds (trade name: ORGANO textile ZC540, the Matsumoto Pharmaceuticals company make) and one copy of silane compound (trade name: A1110, made in Japanese Junker), 40 copies of iso-propanol, and 20 copies of n-butanol on an aluminum substrate. It applied by the dip coating method, stoving was carried out for 10 minutes in 150 degreeC, and the under-coating layer of 0.2 micrometer of thickness was formed.

[0043] Subsequently, 1.2 copies of electronic suction nature group substitution chlorogallium phthalocyanines obtained in working example 1, It mixes with 0.8 copy of polyvinyl butyral (trade name: S lek BM-S, Sekisui Chemical Co., Ltd. make), and 48 copies of n-butanol, and 2 time processings were carried out and the paint shaker was made to distribute with a glass bead. The obtained coating liquid was applied with the wire bar coating method on the above-mentioned under-coating layer, stoving was carried out for 10 minutes in 115 degreeC, and the charge generating layer of about 0.2 micrometer of thickness was formed.

[0044] Next, polycarbonate resin indicated to be two copies of charge transporting material N,N'-diphenyl-N,N'-bis-(m-tolyl) benzidines shown by following structural-formula (II) by following structural-formula (III) [1,1'-di-(p-phenylene) cyclohexane carbonate] The coating liquid obtained by dissolving three copies in 20 copies of chlorobenzene was applied by the dip coating method on the aluminum substrate in which the charge generating layer was formed, stoving was carried out by 120 degreeC for 1 hour, the charge transport layer of 20 micrometers of thickness was formed, and the electrophotographic photoreceptor of the lamination type was obtained.

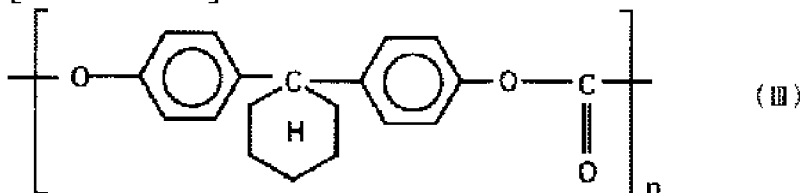
[0045]

[Formula 3]



[0046]

[Formula 4]



MW=39000 (粘度平均分子量)

n=重合度

[0047][Working example 8-12] The electrophotographic photoreceptor was obtained like working example 7 except having used what was obtained in working example 2-6 as electronic suction nature group substitution chlorogallium phthalocyanine.

[Working example 13] It is ORGANO textile ZC540 on an aluminum substrate like working example 7. Ten copies and A1110 The solution which consists of one copy, 40 copies of iso-propanol, and 20 copies of n-butanol is applied by a dip coating method, In 150 degreeC, stoving was carried out for 10 minutes, and the under-coating layer of 0.2 micrometer of thickness was formed.

[0048]Subsequently, it mixes with 0.8 copy of S lek BM-S, and 18 copies of n-butanol, and with the glass bead, with the paint shaker, 2 time processings of 1.2 copies of electronic suction nature group substitution chlorogallium phthalocyanines obtained in working example 1 were carried out, and they were distributed. The obtained coating liquid was applied with the wire bar coating method on the above-mentioned under-coating layer, stoving was carried out for 60 minutes in 115 degreeC, the charge generating layer of about 10 micrometers of thickness was formed, and the electrophotographic photoreceptor of the monolayer type was obtained.

[Working example 14] The electrophotographic photoreceptor was obtained like working example 13 except having used what was obtained in working example 5 as electronic suction nature group substitution chlorogallium phthalocyanine.

[0049]Thus, electrophotographic properties were measured as follows about the electrophotographic photoreceptor of the comparative examples 3-5 acquired by acquired working example 7-14 and the postscript.

[0050]A photo conductor is electrified in initial surface potential-800(V) using a machine scanner by the corona discharge under the environment

of ordinary temperature normal relative humidity (20degreeC, 40%RH), It was neglected for 0.538 second,  $V_{DDP}(V)$  was measured, and dark decay  $V_{DDR}(V)$  ( $V_{DDR}=V_{DDP}-(-800)$ ) was computed. Then, the spectrum of the light of a tungsten lamp was carried out to 780-nm monochromatic light using the monochromator, it irradiated with it on the photo conductor surface, and initial sensitivity (initial value of attenuation potential per unit light volume)  $dV/dE$  (kV- $m^2/J$ ) was measured. Rest potential  $V_{RP}(V)$  after a 10 mJ/ $m^2$  exposure was measured. A measurement result is shown in Table 1.

[0051]

[Table 1]

	用いたガリウムフタロシアニン	$V_{DDP}$ (V)	$V_{DDR}$ (V)	$dV/dE$ (kV $m^2/J$ )	$V_{RP}$ (V)
実施例 7	実施例 1	-787	13	192	29
実施例 8	実施例 2	-786	14	193	26
実施例 9	実施例 3	-772	28	204	18
実施例10	実施例 4	-785	15	188	32
実施例11	実施例 5	-788	12	198	30
実施例12	実施例 6	-773	27	208	15
実施例13	実施例 1	-782	18	216	55
実施例14	実施例 5	-785	15	220	51
比較例 3	比較例 1	-785	15	183	52
比較例 4	比較例 2	-788	12	175	55
比較例 5	比較例 1	-787	13	152	82

[0052][The example 1 of comparison composition] Ten copies of phthalonitriles are distributed in 20 copies of alpha-chloronaphthalenes at a room temperature under the synthetic nitrogen atmosphere of chlorogallium phthalocyanine, After adding 3.1 copies of gallium trichloride with 45 copies of alpha-chloronaphthalenes and making it react in 200 degreeC for 5 hours, output was filtered at the time of heat and DMSO and methanol washed. Subsequently, reduced pressure drying of the moist cake was carried out, and 7.1 copies of

chlorogallium phthalocyanines were obtained.

[Comparative example 1] Except having used the chlorogallium phthalocyanine obtained in the example 1 of comparison composition, it processed like working example 1 and 0.4 copy of chlorogallium phthalocyanine was obtained.

[Comparative example 2] Except having used the chlorogallium phthalocyanine obtained in the example 1 of comparison composition, it processed like working example 4 and 0.4 copy of chlorogallium phthalocyanine was obtained.

[Comparative examples 3-4] The electrophotographic photoreceptor was obtained like working example 7 except having used what was obtained by the comparative examples 1-2 as gallium phthalocyanine.

[Comparative example 5] The electrophotographic photoreceptor was obtained like working example 13 except having used what was obtained by the comparative example 1 as gallium phthalocyanine.

[Working example 15] Five copies of electronic suction nature group substitution chlorogallium phthalocyanines obtained in working example 1, It mixes with one copy of polyvinyl butyral resin (Sekisui Chemical [ Co., Ltd. ] make: S lek BM-S), and 80 copies of butyl acetate, With 250 copies of 1/8-inch steel balls, the coating liquid obtained after 5-hour distribution with the paint shaker was applied on the aluminum substrate, stoving was carried out for 15 minutes in 100 \*\* by the dip coating method, and the under-coating layer of 2 micrometers of thickness was formed.

[0053]Next, 1.0 copy of X type metal free phthalocyanine is mixed with one copy of polyvinyl butyral resin (Sekisui Chemical [ Co., Ltd. ] make: S lek BM-1), and 100 copies of butyl acetate, With 250 copies of 1/8-inch steel balls, the coating liquid obtained after 2-hour distribution with the paint shaker was applied on the under-coating layer on an aluminum base, stoving was carried out for 10 minutes in 100 \*\* by the dip coating method, and the charge generating layer of 0.18 micrometer of thickness was formed.

[0054]It is shown by two copies of N,N'-diphenyl-N,N'-bis-(m-tolyl) benzidines shown by said structural-formula (II) below, and said structural-formula (III). [1,1'-di-(p-phenylene) cyclohexane carbonate] The coating liquid obtained by dissolving three copies in 20 copies of chlorobenzene was applied by the dip coating method on the aluminum

substrate in which the charge generating layer was formed, it heated in 115 °C for 1 hour, and the charge transport layer of 20 micrometers of thickness was formed.

[Working example 16-20] The electrophotographic photoreceptor was obtained like working example 15 except having used what was obtained in working example 2-6 as electronic suction nature group substitution chlorogallium phthalocyanine.

[Comparative example 6] An under-coating layer was not provided in working example 15, but others produced the photo conductor by the same formula.

[Comparative example 7] In working example 15, the coating liquid which dissolved five copies of methoxymethyl-ized nylon (TOREJIN EF-30T, product made from Imperial Chemicals Industry) in 90 copies of methanol was used for the coating liquid for under-coating layers, and also the photo conductor was produced by the same formula.

[Comparative example 8] Changed to the electronic suction nature group substitution chlorogallium phthalocyanine used for the under-coating layer in working example 15, and 1.0 copy of R-perylene red 190 crystal was used, and also the photo conductor was produced by the same formula as working example 15.

[0055]Electrophotographic properties were measured as follows about the electrophotographic photoreceptor which is the photo conductor evaluation above of working example 15-20 and the comparative examples 6-8, and was made and produced.

[0056]Electrostatography paper test equipment (the Kawaguchi electrical-and-electric-equipment company make: erection loss TATTIKU analyzer EPA-8100) is used, and it is ordinary temperature normal relative humidity (20 °C). After electrifying a photo conductor by -6kV corona discharge under the environment of 50%RH, the spectrum of the light of a tungsten lamp was carried out to 780-nm monochromatic light using the monochromator, and it adjusted and glared so that it might become 1 microwatt/cm<sup>2</sup> on the photo conductor surface. And reduction-by-half light exposure  $E_{1/2}$  (μJ/cm<sup>2</sup>) until it is set to one half of the initial surface potential  $V_O$  (volt) and  $V_O$  were measured, the photo conductor surface was irradiated with the tungsten light of 10lux for 1 second after that, and rest potential  $V_R$  (volt) was measured. It measured also about extinction ratio DDR (%). Above-



mentioned electrification,  $V_O$  [ after repeating exposure 3000 times ],  $E_{1/2}$ , DDR, and  $V_R$  was measured. A drum photo conductor is produced on the still more nearly same conditions as working example 15-20 and the comparative examples 6-8, and it is a laser beam printer (Fuji Xerox make: FXXP-15 was equipped, the copied image was formed and the copy was repeated 20,000 times.) about this electrophotographic photoreceptor. Those results are shown in Table 2.

[0057]

[Table 2]

	下引層	初期特性 ( 1 回 )				維持特性 ( 3000回 )				複写画像 画質 (2万回後)
	含有させる 化合物	$V_O$ (V)	$E_{1/2}$ ( $\mu J/cm^2$ )	DDR (%)	$V_{RP}$ (V)	$V_O$ (V)	$E_{1/2}$ ( $\mu J/cm^2$ )	DDR (%)	$V_{RP}$ (V)	
実施例15	実施例 1	-818	4.6	2.0	22	-820	4.6	2.0	22	欠陥なし
実施例16	実施例 2	-821	4.5	2.0	21	-819	4.8	2.0	24	欠陥なし
実施例17	実施例 3	-832	4.4	2.0	23	-829	4.7	2.0	26	欠陥なし
実施例18	実施例 4	-830	4.6	2.1	24	-830	4.6	2.1	27	欠陥なし
実施例19	実施例 5	-832	4.5	2.0	25	-831	4.6	2.0	28	欠陥なし
実施例20	実施例 6	-832	4.7	1.9	18	-830	4.7	2.1	23	欠陥なし
比較例 6	下引層なし	-675	4.8	4.0	33	-675	5.7	5.5	41	黒点多発
比較例 7	メトキシメチル 化ナロン	-705	4.7	3.0	24	-675	5.4	4.1	39	黒点多発
比較例 8	ベリレンレッド R-190	-741	4.7	2.8	23	-675	5.5	3.2	34	微少黒点多 発

[0058]

[Effect of the Invention] Since sensitization wavelength is extended to nearly 780 nm, the photoconducting material using the electronic suction nature group substitution chlorogallium phthalocyanine obtained by the manufacturing method of this invention is dramatically useful as photoconducting materials for electrophotographic photoreceptors, such as a printer, digital copia, etc. using a semiconductor laser. The electrophotographic photoreceptor of this invention electronic suction nature group substitution chlorogallium phthalocyanine from having made a kind contain at least in a

photosensitive layer and/or an under-coating layer. An electrophotographic photoreceptor with high reliability which gives the good picture which high sensitivity is maintained, high electrostatic property and low rest potential nature do not deteriorate even if it cancels and uses the fault in a conventional photosensitive layer or under-coating layer repeatedly, therefore a fall or greasing of image concentration do not produce in long-term use can be provided.

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[Translation done.]